

D.P.U. 91-273

Petition of Taunton Municipal Lighting Plant for approval by the Department of Public Utilities, pursuant to G.L. c. 164, § 56D, of an Electricity Purchase Agreement between Taunton Municipal Lighting Plant and the Silver City Energy Limited Partnership.

D.P.U. 92-273 (Phase I)

Petition of Taunton Municipal Lighting Plant for approval of its 1991 long-range forecast of electricity requirements and resources.

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I. INTRODUCTION

A. Background

Taunton Municipal Lighting Plant ("TMLP" or "Lighting Plant") is a municipally-owned electric utility serving the City of Taunton ("Taunton"), the towns of Raynham and Berkley, and portions of the towns of North Dighton and Lakeville, in Bristol County. In 1992, the Lighting Plant served 28,848 retail customers (Exh. TMLP-2, at 9). In 1992, the Lighting Plant had total energy requirements of 485,645 megawatt hours ("MWH") and experienced a summer system peak of about 90 megawatts ("MW") and a winter system peak of about 84 MW (id. at 67; Exh. DPU-RR-1, at 2).¹

TMLP owns and operates a two-unit generating station, the Cleary-Flood station (id. at 9). One unit is a 26 MW oil-fired steam generator ("Unit No. 8") operating in a peaking mode (id.). The other unit is a 110 MW dual-fueled (oil and natural gas) combined cycle unit ("Unit No. 9") operating in an intermediate mode under the dispatch of the New England Power Exchange ("NEPEX") (id.). In addition, TMLP purchases power from various sources in New York, Maine, Vermont, Massachusetts, and Canada (Exhs. TMLP-1, Vol. II at 12; TMLP-4 at 2-3; DPU-10).

B. Procedural History

On May 13, 1991, pursuant to G.L. c. 164, §§ 69H through 69S, TMLP filed with the Energy Facilities Siting Council ("Siting Council") its long range forecast of electricity needs and

¹ The Lighting Plant provided a table which indicates that total energy requirements for 1992 were 485,646 MWH (Exhs. TMLP-2, at 67; DPU-RR-1, at 2). However, the sub-totals provided for each forecast class add up to 485,645 MWH (Exhs. TMLP-2, at 67; DPU-RR-1, at 2). See Table 1 attached to this Order.

requirements for the period 1990-1999. The Siting Council docketed the filing as EFSC 91-51. On December 20, 1991, TMLP filed with the Siting Council an updated and supplemented forecast and supply plan, covering the forecast period 1990-1999 (Exh. TMLP-1, Vols. I & II). On May 27, 1992, the Siting Council issued a notice of adjudication that set July 6, 1992 as the date for any person to file a petition for leave to intervene. On July 23, 1993, TMLP filed a further update to the demand forecast, covering the forecast period 1993-2002, in response to a Department information request (Exh. TMLP-2). Finally, in response to a Department record request, on December 23, 1993, TMLP filed an update to the July 23, 1993 forecast which employed August 1993 data (Exh. DPU-RR-1, at 1).² TMLP stated that it supported the December 23, 1993 update as the most recent, reliable forecast in the record (id.; Tr. 3, at 23-24). The December 23, 1993 forecast is the subject of this Order.³

On November 27, 1991, pursuant to G.L. c. 164, § 56D, TMLP filed with the Department a request for approval of a 30 MW power purchase contract between TMLP and Silver City Energy Limited Partnership ("SCE"), the developer of the Taunton Energy Center ("TEC"), a proposed coal plant to be built on property leased to SCE by TMLP. The Department docketed the contract review case as D.P.U. 91-273.

On September 1, 1992, the Siting Council merged with the Department. Following the

² TMLP stated that, with the exception of the methodology used to forecast peak load, the December 23, 1993 forecast employs the same exogenous variables and the historic periods used to develop the individual sector sales forecasts as had been employed to calculate the July 23, 1993 forecast (Exh. DPU-RR-1, at 1).

³ Unless otherwise noted, all references to a forecast in this Order are to the December 23, 1993 update.

merger of the agencies, the Department redocketed EFSC 91-51, the forecast and supply plan case, as D.P.U. 92-273. The Department consolidated the forecast/supply plan and contract cases by Order of March 30, 1993, based on its finding that the forecast/supply plan and contract approval cases involved common questions of law and fact with respect to the adequacy of resource planning and determination of resource need.

Prior to the consolidation Order, the Department granted the petitions to intervene in the forecast case filed by the Attorney General of the Commonwealth of Massachusetts ("Attorney General"), SCE, and COAL-FACTS, a Taunton citizen's group. No petitions to intervene were filed in the contract approval case. The Department provided in the consolidation Order that intervenors in the forecast/supply plan case would be intervenors in the contract case and vice versa. On November 15, 1993, the Massachusetts Public Interest Research Group ("MASSPIRG") filed a late petition to intervene in the consolidated proceeding.⁴ The Hearing Officer denied the petition to intervene on the grounds that MASSPIRG failed to: (1) explain how its interests were unique and could not be adequately represented by the Attorney General or COAL-FACTS, (2) explain why its petition was late-filed, and (3) demonstrate how its interest outweighed the Department's need to conduct the proceeding in a complete, efficient, and orderly fashion (Taunton Municipal Lighting Plant, D.P.U. 91-273/92-273, Hearing Officer Ruling at 6 (November 19, 1993)). MASSPIRG appealed the Hearing Officer Ruling and, by Order of January 19, 1994, the Department upheld the denial of MASSPIRG's petition.

At the request of TMLP, the Department canceled forecast and supply plan hearings

⁴ MASSPIRG's petition to intervene was filed 16 months after the intervention deadline in D.P.U. 92-273 and nine months after the intervention deadline in D.P.U. 91-273.

scheduled for October 1993 in order to accommodate negotiations in Newbay Corporation, D.P.U. 88-265, which affected TMLP's supply plan (Taunton Municipal Lighting Plant, D.P.U. 91-273/92-273, Hearing Officer Ruling on Motion to Delay Hearings (October 18, 1993)). The Department proceeded with its consideration of the demand forecast and, in November 1993, held two days of evidentiary hearings on the demand forecast. On March 15, 1994, the Hearing Officer issued a ruling phasing the Order in the consolidated proceeding since the outcome in the Newbay case affected the supply plan.⁵ On April 1, 1994, the Department held a final hearing on the demand forecast.

This Order resolves the demand forecast issues of D.P.U. 92-273, which is Phase I of the proceeding. A subsequent Order in Phase II of the proceeding will address the supply plan issues of D.P.U. 92-273 and the contract which is the subject of D.P.U. 91-273.

In support of its demand forecast, the Lighting Plant sponsored the testimony of two witnesses: Mayhew D. Seavey, a partner consultant with Power Line Models; and Mark Cordeiro, a consultant with Power Line Models. The Phase I evidentiary record includes 46 Department exhibits, four Lighting Plant Exhibits, 20 responses to Department record requests and five responses to Attorney General record requests. TMLP and SCE filed briefs on the demand forecast on April 15, 1994.⁶ No parties filed reply briefs.

⁵ On March 18, 1994, eleven municipal light departments, including TMLP, along with Newbay Corporation and the Blackstone Park Improvement Association, submitted to the Department an Offer of Settlement and Termination of Proceedings in D.P.U. 88-265. On May 2, 1994, the Department approved the Offer of Settlement. See Newbay Corporation, D.P.U. 88-265-A (1994).

⁶ By letter of April 15, 1994, the Attorney General indicated that he did not intend to
(continued...)

II. DEMAND FORECAST REVIEW

A. Standard of Review

Pursuant to G.L. c. 164, § 69I, the Department shall approve a long range forecast if it meets the following requirements:

all information relating to current activities, environmental impact, facilities agreements and energy policies as adopted by the commonwealth is substantially accurate and complete; projections of the demand for electric power, or gas requirements and of the capacities for existing and proposed facilities are based on substantially accurate historical information and reasonable statistical projection methods and include an adequate consideration of conservation and load management; . . . projections relating to service area, facility use and pooling or sharing arrangements are consistent with such forecasts of other companies subject to this chapter as may have already been approved and reasonable projections of activities of other companies in the New England area; . . . and are consistent with the policies stated in section sixty-nine H to provide a necessary power supply for the commonwealth with a minimum impact on the environment at the lowest possible cost.

Under the standard set forth in G.L. c. 164, § 69I,⁷ the Siting Council has applied three criteria to demand forecasts: reviewability, appropriateness, and reliability. A forecast is reviewable if it contains enough information to allow full understanding of the forecasting methodology. A forecast is appropriate if the methodology used to produce the forecast is technically suitable to the size and nature of the utility that produced it. A forecast is reliable if the methodology provides a measure of confidence that its data, assumptions, and judgments produce a forecast of what is most likely to occur. See, e.g., Boston Edison Company, 24

⁶(...continued)

file an initial brief on the demand forecast.

⁷ Prior to the merger of the Department and the Siting Council, demand forecasts were filed pursuant to G.L. c. 169, § 69J, which contained substantially the same provisions as the current G.L. c. 164, § 69I.

DOMSC 125, 146 (1992) ("1990 BECo Decision"); Braintree Electric Light Department, 24 DOMSC 1, 5 (1992) ("1992 BELD Decision"); Nantucket Electric Company, 21 DOMSC 208, 214 (1991) ("1991 Nantucket Decision").

B. Previous Demand Forecast Review

In Taunton Municipal Light Plant, 15 DOMSC 169 (1986), the Siting Council approved the 1984 Forecast Supplement of Taunton Municipal Lighting Plant subject to the following conditions:

1. TMLP shall provide in its next filing an analysis which compares, by residential rate class in 1986, average full-year usage levels for new customers connected in 1985 with old customers connected prior to 1985. TMLP also shall report and discuss the forecasting implications of the relative rates of change over the base period for service-area population, total residential customers and base-class customers.
2. TMLP shall provide in its next filing compilations of annual industrial sales by SIC code for all available years from 1984 through 1986, discuss implications of sectoral trends for its forecasting in general, and report as appropriate on its consideration of specific modeling changes to better capture sectoral growth patterns.

Taunton Municipal Light Plant, 15 DOMSC 169, 185 (1986).

The Department notes that the filing referred to by the Siting Council in the above conditions was submitted by the Lighting Plant on April 1, 1987. However, the Siting Council did not issue a decision with regard to the 1987 filing. Therefore, at this time, it is necessary for the Department to determine the appropriateness of analyzing the Lighting Plant's compliance with conditions, originally set out in 1986, in the instant docket.

Given the time that has passed since the conditions were issued, the Department must determine the time-sensitivity of the conditions as a prerequisite to establishing their applicability to this review. Since Condition 1 relates to a study comparing usage of 1986 customers with that

of pre-1986 customers, the Department finds this data to be time-sensitive and of little value in the current proceeding. Therefore, the Department finds it would be inappropriate to review the Lighting Plant's compliance with Condition 1 in the instant docket. Similarly, Condition 2, relating to industrial sales data for the 1984-1986 period, is also time-sensitive and therefore inapplicable to the Department's review in the instant case. In this review, the Department will evaluate the Company's residential forecast methodology and industrial forecast methodology based on information submitted in this proceeding. See Sections II.C.4 and II.C.6, infra.

C. Energy Forecast

1. Overview

The forecast which is the subject of this Order extends from 1993-2002 and forecasts compound growth in adjusted energy requirements, i.e., adjusted to account for the effects of Lighting Plant-sponsored demand-side management ("DSM"), of 2.86 percent (Exh. DPU-RR-1, at 2).⁸ TMLP forecasts adjusted compound growth in peak demand of 3.09 percent (id. at 6).

2. Economic and Demographic Forecast

a. Description

TMLP stated that it relied on forecasts of four key economic and demographic variables and that these forecasts represented the major drivers of its overall energy forecast (Exhs. TMLP-2, at 17, 47-48; DPU-68; DPU-71). In selecting economic and demographic variables to be included in its forecast, TMLP stated that it analyzed the historical relationship between a range of economic variables and actual electricity use (Exh. TMLP-1, Vol. I, at 16-17, 52). Where the

⁸ The adjusted compound growth rates used in this Order for individual forecast sectors are derived from data provided by TMLP in Exh. DPU-RR-1, at 2.

Lighting Plant found a strong correlation between economic/demographic variables and electricity use, the Lighting Plant incorporated forecasts of those variables (Tr. 1, at 25). TMLP stated that it obtained economic and demographic data from Data Resources, Inc. ("DRI") (Exhs. TMLP-1, Vol. I, at 4, 7; TMLP-2, at 7-8; Tr. 1, at 14).⁹

TMLP indicated that its economic forecast consisted of: (1) 1993 non-manufacturing employment for the New Bedford-Fall River-Attleboro Standard Metropolitan Area ("SMA");¹⁰ (2) 1993 per-capita income for Bristol County; and (3) 1993 Consumer Price Index (Exhs. DPU-RR-1, at 1; TMLP-2, at 17, 47-48; TMLP-1, Vol. I, at 7).

For its demographic forecast, TMLP stated that it relied on 1993 Massachusetts households data, also obtained from DRI (Exhs. TMLP-2, at 17; DPU-RR-1, at 7). TMLP stated that it selected Massachusetts households as the primary driving variable for base residential customers because none of the alternative variables tested (including Massachusetts population, Bristol County population, and Bristol County households) produced models with valid statistics (Exh. DPU-68).

TMLP stated that it attempted to employ Bristol County data in its forecast of the number of residential customers but the results failed to meet acceptable levels of statistical performance (Exh. TMLP-2, at 16-18). Further, TMLP argued that statewide data was appropriate for its

⁹ The Lighting Plant also noted that a direct communications link with DRI's Regional Information Service has been established, allowing immediate transmittal of DRI economic updates (Exh. TMLP-1, Vol. I, at 7).

¹⁰ TMLP stated that DRI projects economic activity for a limited number of SMAs (Tr. 1, at 29-30). The Lighting Plant indicated that the SMA closest to its service territory is New Bedford-Fall River-Attleboro (Exh. TMLP-1, Vol. I, at 30).

demographic forecast for several reasons (Tr. 1, at 24; TMLP Brief at 13). For example, TMLP claimed that the state and the TMLP service territory have experienced strong economic growth over the last decade, while Bristol County has not experienced the same growth levels (Tr. 1, at 24, 41, 48-49). In particular, the Company argued that the proximity of Interstate 495 to Taunton has made the TMLP service area particularly attractive for development (Exhs. DPU-RR-3; DPU-RR-4; DPU-RR-18; Tr. 1, at 41; Tr. 3, at 27). TMLP contended that 1990 Census data indicate that Taunton is one of only nine cities in the state to show an increase in population since the 1990 Census and that projections published by the Southeast Regional Planning and Economic Development District support the strong growth rates TMLP is projecting (Tr. 3, at 28-29).

TMLP indicated that its demographic forecast was used primarily as an input to the calculations of the number of residential customers and the number of commercial customers (Exhs. DPU-68; TMLP-2, at 17-18, 37). To calculate the number of residential customers, TMLP first developed a regression equation which determined the statistical relationship between the number of its residential customers and DRI's estimate of Massachusetts households (Exh. TMLP-2, at 17-18). Next, the Lighting Plant projected its residential customer growth rate based on DRI's growth rate for Massachusetts households (Exhs. TMLP-2, at 17; AG-RR-3). TMLP backcast the model and found a maximum deviation between the actual and backcast number of residential customers of 3.0 percent for the 1984-1992 period (Exh. DPU-RR-1, at 7).

Using the foregoing methodology, TMLP's December 20, 1991 forecast predicted 23,089 residential customers for 1992 (Exh. TMLP-1, Vol. I, at 23-25). However, TMLP actually

served 23,618 customers for that year (Exhs. TMLP-2, at 22, 24; DPU-RR-1, at 7). For 1993, a similar discrepancy resulted, with TMLP's methodology forecasting 22,873 residential customers, while the actual number of residential customers increased by 455 over the 1992 residential customer count (Exh. DPU-RR-1, at 7, 8; Tr. 3, at 25).¹¹ TMLP contended that underforecasts of customers contributed to an overall energy forecast that was conservative (TMLP Brief at 24).

TMLP projected the number of commercial customers in a manner similar to that used to project the number of residential customers, by establishing a statistical relationship between the number of TMLP commercial customers and Massachusetts households (Exh. TMLP-2, at 36-38).¹² Consistent with the residential customer methodology, the growth rate for TMLP commercial customers was estimated using DRI's growth rate for Massachusetts households (id. at 36). TMLP backcast the model and found a maximum deviation between the actual and backcast number of small commercial customers of 7.7 percent for the period 1981-1992 (Exh. DPU-RR-1, at 9). The maximum deviation occurred in 1985 and for the remaining 11 years of the historic period, the maximum deviation was 4.0 percent (id.).

Using the foregoing methodology, TMLP predicted 2,757 commercial customers for 1992 (Exh. DPU-RR-1, at 11). However, TMLP actually served 2,817 commercial customers in 1992 (Exhs. TMLP-2, at 41; DPU-RR-1, at 11). Commercial customers were forecast to decrease to 2,751 in 1993 (Exh. DPU-RR-1, at 11). However, the actual number of commercial customers

¹¹ The Lighting Plant had 508 new residential services scheduled for 1993 and actually added 455 of the 508 scheduled new residential services (Exh. DPU-RR-18; Tr. 3, at 25).

¹² Lighting Plant records were used to determine the historic number of commercial customers for the 1981-1992 base period (Exh. TMLP-2, at 37).

was 2,874 as of November 1993 (Exh. AG-RR-3).

TMLP stated that it attempted to employ a variable for the number of households in Bristol County in calculating the number of commercial customers (Exhs. TMLP-2, at 37; DPU-72). However, TMLP noted that this resulted in a sizeable decrease in the projected number of commercial customers, contradicting actual conditions experienced by TMLP (Exhs. DPU-72; DPU-RR-8; AG-RR-3; Tr. 1, at 65-66).¹³ Essentially, TMLP concluded that its commercial sector requirements would suffer a serious underprojection if Bristol County data were used (Exh. DPU-RR-8). TMLP argued, therefore, that both statistical analyses and growth trends support its use of Massachusetts households as a variable (TMLP Brief at 17).

b. Analysis and Findings

The record indicates the Lighting Plant used economic data that reflected county-specific, SMA, or statewide trends. The record further indicates that the Lighting Plant used recent economic data in each of the forecast updates provided. In past decisions, the Siting Council and the Department have accepted electric company economic forecasts that were obtained from DRI and that were timely. Eastern Edison Company and Montaup Electric Company, D.P.U. 92-214, at 10-11 (1993); Northeast Utilities, 24 DOMSC 77, 86-87 (1992); Massachusetts Municipal Wholesale Electric Company, 20 DOMSC 1, 15-16 (1990), aff'd in part, rev'd in part, 411 Mass. 183 (1991).

The Lighting Plant used demographic data and a demographic forecasting methodology

¹³ TMLP stated that use of the Bristol County data produced a forecast of 2,582 commercial customers for 1993, compared to an actual count of 2,874 as of November 1993 (Exh. AG-RR-3).

similar to data and methodologies previously accepted by the Siting Council and the Department. In past decisions, the Siting Council and the Department have accepted demographic data that were obtained from DRI and that were timely, and have approved demographic forecasting methodologies based on either service-territory-specific data, or econometric equations that analyzed the relationship between service-territory-specific data and corresponding statewide projections. Eastern Edison Company and Montaup Electric Company, D.P.U. 92-214, at 10-11 (1993); Northeast Utilities, 24 DOMSC 77, 86-87 (1992); Commonwealth Electric Company and Cambridge Electric Light Company, 22 DOMSC 116, 126 (1991). Backcasts of the models employed to forecast the number of residential and number of small commercial customers demonstrate that the models were reliable.

However, one weakness of TMLP's demographic methodology is its underforecast of the number of residential customers and the number of commercial customers. The Department recognizes that a model specified for the long-term may, in fact, underforecast in the short-term. However, given the importance of demographic inputs to TMLP's residential and commercial energy forecasts, in its next demographic forecast, the Lighting Plant should furnish a report addressing the persistence of underforecasting the number of residential and commercial customers, with an action plan appropriate to the findings of that report.

For purposes of this review, the Department finds TMLP's economic and demographic forecast to be reviewable, appropriate, and reliable.

3. Electricity Price Forecast

a. Description

The Lighting Plant stated that it projected electricity price using its Revenue Requirements Model (Exhs. TMLP-1, Vol. I, at 10; TMLP-2, at 12). TMLP's Revenue Requirements Model projected system costs using ten years of historic information along with estimates of future costs (Exhs. TMLP-1, Vol. I, at 10; TMLP-2, at 12). The results were allocated to customer classes consistent with TMLP rate design practices (Exhs. TMLP-1, Vol. I, at 10; TMLP-2, at 12). Electricity price was evaluated as an independent variable in TMLP's econometric models, but in no case was it found to be statistically significant enough to warrant inclusion as a variable for any class in the July 23, 1993 forecast (Exh. TMLP-2, at 12).¹⁴

b. Analysis and Findings

The record indicates that TMLP developed electricity price using a revenue requirements methodology. Further, the record indicates that system costs were subdivided based on rate design concepts. However, the Department notes that price was not included in any of TMLP's econometric equations for the 1993-2002 forecast period due to a lack of statistical significance. See Sections II.C.4-7, infra. Therefore, TMLP's electricity price projection was not a factor in TMLP's forecast of energy requirements.

In a previous decision, the Siting Council approved an electricity price forecast of a similar level of detail for an electric company that is approximately the same size as TMLP. Fitchburg Gas and Electric Company, 24 DOMSC 322, 335 (1992) ("1992 Fitchburg Decision"). In that decision, and in other decisions, electricity price information was included in models underlying company forecasts of demand. Eastern Edison Company and Montaup Electric Company, D.P.U.

¹⁴ TMLP found price to be statistically significant only for the large commercial class in its December 20, 1991 forecast (Exh. TMLP-1, Vol. I, at 11).

92-214, at 14 (1993); 1992 Fitchburg Decision at 335; Northeast Utilities, 24 DOMSC 77, 88 (1992). Here, TMLP has indicated that its electricity price forecast had no effect on the results of its energy forecast.

Accordingly, based on the foregoing, the Department makes no finding on TMLP's electricity price forecast. The Department encourages TMLP to continue to explore the statistical and modeling relevance of price to its forecasts of energy requirements.

4. Residential Energy Forecast

a. Description

i. Base Residential

TMLP's base residential energy sales accounted for 149,145 MWH, or 30.7 percent, of Taunton's total actual energy requirements of 485,645 MWH in 1992 (Exhs. DPU-RR-1, at 2; TMLP-3, at 4-5). TMLP's residential sales grew from 103,828 MWH in 1983 to 149,145 MWH in 1992, a compound growth rate of 4.1 percent (Exhs. DPU-RR-1, at 2; TMLP-3, at 4-5). TMLP forecast adjusted residential sales to grow from 150,032 MWH in 1993 to 208,403 MWH in 2002, a compound growth rate of 3.7 percent (Exhs. DPU-RR-1, at 2; TMLP-3, at 4). See Table 1.

TMLP relied on an econometric model to forecast energy consumption for the residential class (Exh. TMLP-2, at 13, 15). Specifically, TMLP's residential forecast was based on: (1) number of residential customers; and (2) real per-capita income for Bristol County (id. at 15-16; Exh. DPU-RR-1, at 1, 8). For a discussion of the demographic forecast used by TMLP to calculate TMLP's number of residential customers, see Section II.C.2, supra. TMLP indicated

that these components were selected following a comprehensive analysis of different variables and model configurations (Exh. TMLP-2, at 18).¹⁵ TMLP's statistical analysis indicated that the number of residential customers was the primary driving variable of the model (Exhs. TMLP-2, at 16; DPU-RR-1, at 8).¹⁶ TMLP backcast the model and found a maximum deviation between actual and backcast sales of 1.6 percent for the period 1983-1992 (Exh. DPU-RR-1, at 8).

Finally, TMLP noted that actual base residential sales for 1993 exceeded forecast residential sales for that year by 4.9 percent (Exh. TMLP-3, at 5).¹⁷ TMLP had not forecast the level of actual base residential sales experienced in 1993 -- 157,341 MWH -- to occur until 1995 (id.; Exh. DPU-RR-1, at 8).

ii. Residential Electric Heat

TMLP developed a separate econometric model to forecast energy consumption for its residential electric heat class (Exh. TMLP-2, at 26). TMLP stated that residential electric heat class sales accounted for 29,395 MWH, or 6.1 percent, of TMLP's total actual energy requirements of 485,645 MWH in 1992 (Exhs. TMLP-3, at 4; DPU-RR-1, at 2, 10). TMLP

¹⁵ TMLP stated that it rejected the following variables: (1) heating degree days; (2) price of electricity; (3) real price; and (4) per-capita income (Exh. TMLP-2, at 17, 25). TMLP rejected these variables because there was at least one statistical measure in each that was not as valid as the measures provided by the chosen model (Exhs. DPU-68; DPU-70; Tr. 1, at 59-62).

¹⁶ TMLP's statistical analysis indicated that the number of customers variable has a T-Statistic of 37.26 and an elasticity of 1.64 (Exh. DPU-RR-1, at 8). The real per-capita income variable has a T-Statistic of 2.48 and an elasticity of 0.13 (id.). The T-statistic is a measure of the significance of the coefficient of the independent variable.

¹⁷ TMLP noted that 1993 was an extreme weather year and that there were 664 cooling degree days in 1993 which was approximately 40 percent higher than the norm of 472 cooling degree days (Tr. 3, at 31).

forecast adjusted residential electric heat sales to grow from 28,222 MWH in 1993 to 40,990 MWH in 2002, a compound growth rate of 4.2 percent (Exhs. DPU-RR-1, at 2; TMLP-3, at 5). See Table 1.

TMLP developed its residential electric heat class model by testing a number of economic and demographic variables against historic sales, identifying two independent variables as statistically significant (Exh. TMLP-2, at 26-27). Specifically, the model consisted of: (1) number of residential heat customers; and (2) heating degree days (id.).¹⁸ TMLP backcast the model and found a maximum deviation between actual and backcast sales of 3.2 percent for the period 1983-1992 (Exh. DPU-RR-1, at 10).

¹⁸ From 1989-1992, an average of 5.4 percent of total new residential customers selected electric heat (Exh. DPU-54).

b. Analysis and Findings

The Department notes that TMLP developed a residential forecast methodology using independent variables that relate reasonably to residential energy consumption. TMLP demonstrated that it selected its independent variables based on statistical performance characteristics. In addition, backcasts of the models employed demonstrate that the forecasts of base residential and residential electric heat sales have been reasonably accurate. The growth rates projected for these sectors are lower than, but consistent with, historic growth rates and, as noted in Section II.C.2., are supported by population trends. Accordingly, based on evidence submitted by TMLP in this proceeding, the Department finds the residential forecast to be reviewable, appropriate, and reliable.

Nonetheless, the Department notes that a stronger residential sector forecast would include the effects of factors such as electricity price, and cooling degree days, to the extent that these and other such factors are statistically valid. The Department notes that another electric company has developed econometric residential forecasts that encompass these kinds of factors. Braintree Electric Light Department, 24 DOMSC 1, 16 (1992). The Department encourages TMLP to examine the relevance of a full range of independent variables when developing its residential sector forecasts.

5. Small Commercial Forecast

a. Description

TMLP's adjusted small commercial energy sales accounted for 51,759 MWH, or 10.6 percent, of TMLP's total actual energy requirements of 485,645 MWH in 1992 (Exhs. DPU-RR-

1, at 2; TMLP-3, at 4-5). TMLP's small commercial sales grew from 28,064 MWH in 1983 to 51,759 MWH in 1992, a compound growth rate of 7.0 percent (Exhs. DPU-RR-1, at 2; TMLP-3, at 4-5). TMLP forecast adjusted small commercial sales to grow from 51,151 MWH in 1993 to 81,368 MWH in 2002, a compound growth rate of 5.3 percent (Exhs. DPU-RR-1, at 2; TMLP-3, at 4). See Table 1.

TMLP relied on an econometric model to forecast its small commercial energy requirements (Exh. TMLP-2, at 13, 35). TMLP tested a number of independent variables and model specifications, but rejected them as inferior to the model selected (id. at 38, 44).¹⁹ The model employed consisted of two variables: (1) number of commercial customers; and (2) per-capita income for Bristol County (id. at 35). TMLP selected its first variable, the number of commercial customers, after statistical tests validated its significance and strong explanatory power (id.).²⁰ For a discussion of the demographic methodology used by TMLP to forecast the number of commercial customers, see Section II.C.2, supra. TMLP backcast the model and found a maximum deviation between actual and backcast sales of 4.7 percent for the period 1982-1992 (Exh. DPU-RR-1, at 12).

TMLP selected its second variable, per-capita income for Bristol County, after statistical tests confirmed the significance and explanatory power of that variable (id.).²¹ TMLP stated that

¹⁹ TMLP rejected other models because they produced invalid statistics (Exhs. TMLP-2, at 35, 44-45; DPU-61).

²⁰ TMLP's statistical analysis indicated that the number of commercial customers variable had a T-statistic of 24.44 and an elasticity of 1.51 (Exh. DPU-RR-1, at 12).

²¹ TMLP's statistical analysis indicated that the Bristol County per-capita income variable (continued...)

there was a logical link between per-capita income and commercial sales since commercial enterprises serve the local community and reflect its economic vitality (id.).

b. Analysis and Findings

The record indicates that TMLP's econometric model utilized independent variables which exhibited sound statistical performance. In addition, TMLP selected its final model after examining a number of different economic and demographic inputs. We have found that it is reasonable to expect a high degree of correlation between the small commercial population and energy demand for this class. Braintree Electric Light Department, D.P.U. 93-196, at 19 (Phase I) (1994). Backcasts of the model indicate that TMLP's model has historically produced reliable forecasts of small commercial sales. Further, the forecast growth is lower than, but consistent with, the historic growth rate for this sector.

For purposes of this review, the Department finds that TMLP has demonstrated that its commercial forecast is reviewable, appropriate, and reliable.

6. Industrial Forecast

a. Description

TMLP stated that it redefined its industrial class to include both large commercial and industrial customers, to better reflect customer usage behavior (Exhs. TMLP-2, at 46-47; DPU-67). While TMLP's industrial class had always included Rate 31 (primary metering) customers, now TMLP includes Rate 37 (secondary light and power) customers in its industrial class (Exhs. TMLP-2, at 46-47; DPU-67, at 2). TMLP asserted that this redefinition was appropriate because,

²¹(...continued)

had a T-statistic of 3.84 and an elasticity of 0.15 (Exh. DPU-RR-1, at 12).

in recent years, Rate 37 service was increasingly selected by large demand customers (Exhs. TMLP-2, at 46; DPU-67, at 2). TMLP stated that while it attempted to forecast Rates 31 and 37 separately, it was unable to satisfactorily model Rate 37 sales (Exh. DPU-67, at 2). Therefore, TMLP tested the hypothesis of modelling Rates 31 and 37 together and found that the resulting forecast fit the historic data, had a high degree of explanatory power, and a sustainable level of growth (id.).

TMLP's adjusted industrial energy sales represented 213,110 MWH, or 43.9 percent, of TMLP's total actual energy requirements of 485,645 MWH in 1992 (Exhs. TMLP-2, at 66; DPU-RR-1, at 2; TMLP-3, at 4). TMLP's industrial sales grew from 155,817 MWH in 1983 to 213,110 in 1992, a compound annual growth rate of 3.5 percent (Exhs. DPU-RR-1, at 2; TMLP-3, at 4-5). TMLP forecast adjusted industrial sales to grow from 210,148 MWH in 1993 to 238,098 MWH in 2002, a compound growth rate of 1.4 percent (Exh. DPU-RR-1, at 2). See Table 1. TMLP backcast the model and found a maximum deviation between actual and backcast sales of 3.1 percent for the period 1986-1992 (Exh. DPU-RR-1, at 13).

TMLP's industrial energy forecast is based on an econometric model that predicts sales as a function of: (1) non-manufacturing employment for Bristol County; (2) service sector employment for Bristol County;²² and (3) a binary variable (Exh. TMLP-2, at 47-48). DRI was the data source for the foregoing employment information (id. at 49). TMLP stated that it employed the binary variable to capture the effects of a sizeable new customer, the Galleria Mall (id. at 47; Tr. 1, at 94-99). TMLP asserted that without that variable, its model would fail to

²² TMLP explained that service sector employment is a subset of non-manufacturing employment (Exhs. DPU-59; DPU-RR-11).

capture the large change in industrial energy requirements that took place in 1991-1992 (Exh. TMLP-2, at 48). For example, TMLP stated that for the last ten months of 1992, the Galleria Mall accounted for 24,886,787 KWH, or approximately 12 percent, of total adjusted 1992 industrial energy requirements (Exhs. TMLP-2, at 47; DPU-RR-10). In August of 1992, the peak load requirement for the Galleria Mall was 6.4 MW (Exh. DPU-RR-10). TMLP claimed that its chosen model was superior to all of the more than 24 model configurations tested (Exh. TMLP-2, at 47-48).²³ TMLP stated that the selected model had coefficients of the correct sign, with non-manufacturing employment, service sector employment and the binary variable all being positive (id. at 48-49). Further, TMLP stated that the coefficient of determination was strong ($R^2 = .965$); the F-test provided good confidence; and the Durbin-Watson Statistic met acceptable levels (id. at 48).²⁴ Finally, TMLP asserted that its chosen model had been validated by its ability to accurately backcast industrial requirements (id. at 49, 52).

²³ Independent variables rejected by TMLP included: (1) real electricity price; (2) real income (denoting the real income of service sector customers); (3) manufacturing employment for Bristol County; and (4) Massachusetts industrial product (Exh. TMLP-2, at 47-48, 54-55). TMLP rejected real electricity price, real income, and manufacturing employment for Bristol County because the chosen model had a stronger explanatory power (id. at 47-48). TMLP rejected the Massachusetts industrial product variable because it was driven by a DRI prediction of 5.7 percent industrial growth in Massachusetts, which the Lighting Plant stated was inconsistent with industrial productivity in the TMLP service territory (id. at 48).

²⁴ The F-test is a statistical measure of the explanatory power of the regression equation as a whole, focusing on the significance of the coefficients of the independent variables. The Durbin-Watson statistic tests for the presence of autocorrelation, or whether the error terms in a time series projection are independent or not.

b. Analysis and Findings

The record indicates that TMLP has developed an industrial forecast that relies largely on employment data. In addition to employment-driven effects, TMLP has designed its model to account for discrete, sizeable additions to load, such as the Galleria Mall. TMLP has also redefined its industrial customer base to account for rate preferences exhibited by large customers. The record shows that TMLP tested numerous model options, selecting the option that demonstrated sound statistical performance. Backcasts on the model also indicate its reliability.

In previous decisions, the Siting Council approved industrial demand forecasts which relied on econometric methodologies. 1992 BELD Decision at 26; Northeast Utilities, 24 DOMSC 77, 109 (1992). The Siting Council has considered the statistical performance of an electric company's industrial forecast. 1992 BELD Decision at 24-26. Here, TMLP has demonstrated a sufficient level of statistical validity for its industrial model. Accordingly, the Department finds TMLP's industrial forecast to be reviewable, appropriate, and reliable.

However, the Department notes that other electric companies have modeled industrial energy requirements based on factors that related directly to industrial sales. Eastern Edison Company and Montaup Electric Company, D.P.U. 92-214, at 25-27 (1993); Massachusetts Municipal Wholesale Electric Company, 20 DOMSC 1, 33-36 (1990), aff'd in part, rev'd in part, 411 Mass. 183 (1991). Given the importance of the industrial sector in TMLP's overall energy forecast, in its next industrial forecast, TMLP should furnish an evaluation of industrial forecast methodologies based on factors that relate directly to industrial sales. Such an evaluation should examine factors such as production indices for the industrial manufacturers served by TMLP,

effects of technological innovation and customer choice on industrial requirements, and productivity. In addition, TMLP should explore the usefulness of forecasting its large commercial and industrial customers by Standard Industrial Classifications ("SIC") code.²⁵

7. Miscellaneous Energy Requirements

a. Description

TMLP stated that its miscellaneous energy requirements sector consisted of the streetlighting, private area lighting, and losses and internal use categories (Exh. TMLP-2, at 55). TMLP stated that streetlighting represented 4,565 MWH, or less than one percent; private area lighting represented 1,766 MWH, or less than 0.4 percent; and losses and internal use represented 35,905 MWH, or 7.4 percent, of total actual energy requirements of 485,645 MWH in 1992 (Exh. DPU-RR-1, at 2; TMLP-3, at 4-5).

To forecast street lighting, TMLP calculated the average level of use for streetlighting using ten years of historic information (Exh. TMLP-2, at 56). TMLP projected that average level as a constant over the forecast period (id.). Similarly, to forecast losses and internal use, TMLP calculated an historic system loss average of 8.4 percent and assumed that its future losses would continue at that level (id.).²⁶

²⁵ The Department notes that TMLP indicated its intention to examine the possibility of forecasting large commercial and industrial customers by SIC code (Exh. TMLP-2, at 6, 47; Tr. 1, at 83, 97; TMLP Brief at 18).

²⁶ TMLP noted that for power purchases outside of TMLP's system, transmission losses are calculated by NEPOOL and added to TMLP's load for energy billing purposes (Exh. DPU-38). TMLP asserted that transmission losses are difficult to forecast since they are dependent on NEPOOL's transmission line loads (id.). TMLP noted that distribution losses are a function of the types of transformers and lines making up the system, as well as the (continued...)

b. Analysis and Findings

The record indicates that the Lighting Plant has subdivided its miscellaneous energy forecast into major categories of use. The record further indicates that the Lighting Plant has largely relied on historic data as the basis for projecting its future miscellaneous energy requirements. One weakness of TMLP's miscellaneous forecast is its reliance on constant usage levels. To the extent that past levels of streetlighting and losses and internal use are anticipated in the future, use of a constant can accurately predict that future level of use. However, in light of new residential and commercial construction expected to take place in the TMLP geographic area, the Department encourages TMLP to actively monitor its use of constants in its miscellaneous sector forecast.

For purposes of this review, the Department finds TMLP's forecast of miscellaneous energy requirements reviewable, appropriate, and reliable.

8. Conclusions on the Energy Forecast

The Department has found TMLP's economic and demographic forecast to be reviewable, appropriate, and reliable. The Department has made no finding on TMLP's electricity price forecast. In addition, the Department has found: (1) TMLP's forecast of residential energy requirements to be reviewable, appropriate, and reliable; (2) TMLP's forecast of commercial energy requirements to be reviewable, appropriate, and reliable; (3) TMLP's forecast of industrial energy requirements to be reviewable, appropriate, and reliable; and (4) TMLP's forecast of miscellaneous energy requirements to be reviewable, appropriate, and reliable.

²⁶(...continued)
amount of current sent through the distribution system (id.).

Accordingly, the Department finds that TMLP's forecast of energy requirements is reviewable, appropriate, and reliable.

III. PEAK LOAD REQUIREMENTS

A. Description

TMLP's unadjusted peak load requirements grew from 66 MW in 1983 to 92 MW in 1992, a compound annual growth rate of 3.76 percent (Exh. DPU-RR-1, at 6). See Table 2. Over the forecast period 1993-2002, TMLP forecasts its unadjusted peak requirements to increase from 96 MW to 128 MW, a compound annual growth rate of 3.21 percent (id.). See Table 3. When the effects of Lighting Plant-sponsored DSM are taken into account, TMLP's peak requirements are reduced to 123 MW in 2002, representing a compound annual growth rate of 3.09 percent (id.).

TMLP stated that it forecast peak load in its December 23, 1993 update using a regression equation with two independent variables: (1) energy sales; and (2) monthly average temperature (Exh. DPU-RR-1, at 1; Tr. 3, at 17). TMLP selected energy sales for use in its peak load model based on a statistically significant correlation between peak load and historic energy sales (Exh. DPU-RR-1, at 1). TMLP stated that its most recent energy forecast relied on 1993 economic data (id.).

TMLP stated that its weather variable was only recently added to its model following an updated regression analysis (Tr. 3, at 9-10). TMLP's updated analyses were undertaken in response to temperature-related peak loads noted in recent years (Exh. DPU-RR-1; Tr. 3, at 10).²⁷ TMLP asserted that its enhanced model exhibited a high degree of statistical significance

(continued...)

with the weather variable included, and that it was tested with backcasting techniques (Exh. DPU-RR-1; Tr. 3, at 10, 15).²⁸

For the base case, TMLP's peak load model assumed average temperature effects (Tr. 3, at 23). Historic data was used to establish the weather average, using the average of temperatures recorded during TMLP's peak month over a thirty-two year period, 1962-1993 (Exh. DPU-RR-21). TMLP contended that since its peak load forecast was based on average weather conditions -- with a constant weather coefficient in its regression equation -- 100 percent of its peak load growth was due to growth in energy requirements (Tr. 3, at 23).

In addition to the base case estimate of peak load growth, TMLP developed two additional peak load scenarios using adjustments to its weather variable (id. at 11). The scenarios developed were a low projection and a high projection, encompassing extremes of weather that are expected to occur only 10 percent of the time in each case (id. at 12-13).

²⁷(...continued)

²⁷ For 1993, TMLP reported an actual peak load of 101 MW in August (Exhs. DPU-RR-1; DPU-RR-15). High temperatures, exceeding 91 degrees Fahrenheit, were recorded three times during that month (Exh. DPU-RR-15).

²⁸ TMLP's witness, Mr. Seavey, stated that TMLP is presently installing its own weather monitoring equipment to obtain hour-by-hour service-territory-specific weather data (Tr. 2, at 21-22). In the instant filing, TMLP used National Oceanic and Atmospheric Administration weather data compiled at the Blue Hill Observatory in Milton, Massachusetts (id. at 21; Exh. DPU-RR-21).

B. Positions of the Parties²⁹

1. TMLP

TMLP argues that its peak load forecast meets Department standards (TMLP Brief at 27-28). Specifically, TMLP contends that: (1) its methodology is sound, and in fact has been enhanced through the addition of a weather variable; (2) current economic events, such as population growth, employment, and low commercial vacancy rates support its projections of peak load growth; and (3) over the 1990-1993 period, actual peak growth exceeded forecast growth (*id.* at 23-27). Further, TMLP notes that its recent growth was distributed across all customer sectors, and that this strong growth is expected to continue in all sectors (*id.* at 24-25).

In sum, TMLP argues that it has presented a peak load forecast that is reviewable, appropriate, and reliable (*id.* at 27-28).

2. Silver City Energy Limited Partnership

SCE argues that the evidentiary basis is more than sufficient for an approval of TMLP's peak load forecast, and that TMLP has met the Department's standards of review (SCE Brief at 2-3). SCE notes that TMLP has filed numerous updates to its peak load forecast, and that its econometric methodology is sound (*id.* at 2).

C. Analysis and Findings

The record indicates that TMLP has developed a base case peak load forecast that is driven by its energy forecast. Further, the record indicates that TMLP's peak load forecast used recent data inputs, of 1993 vintage. In addition, the record indicates that TMLP has recently

²⁹ By letter of April 15, 1994, the Attorney General indicated that he did not intend to file an initial brief on the demand forecast.

supplemented its peak load model, adding the capability to model weather extremes. Statistical tests validated the performance of TMLP's peak load model.

In previous decisions, the Siting Council has approved peak load methodologies which used energy sales as the primary driver of an econometric model. 1992 BELD Decision at 31; Massachusetts Municipal Wholesale Electric Company, 20 DOMSC 1, 38-39 (1990), aff'd in part, rev'd in part, 411 Mass. 183 (1991). Here, the Department has accepted TMLP's underlying energy forecasts used to project peak requirements. See Section II.C.8, supra. In addition, the Department notes that actual events, such as residential development and large commercial installations, support TMLP's projection of peak load growth. Accordingly, the Department finds the Lighting Plant's peak load forecast to be reviewable, appropriate, and reliable.

D. Conclusions on the Demand Forecast

The Department has found TMLP's energy forecast to be reviewable, appropriate, and reliable. In addition, the Department has found TMLP's peak load forecast to be reviewable, appropriate, and reliable. We note that growth rates for some of TMLP's individual sectors could be considered relatively high. While forecasting can be expected to produce outcomes that vary from one electric company to another due to dissimilarities within each company's customer base, the range of variation can also, by itself, elicit a concern. It has not been the practice of the Siting Council or the Department to compare the output of different utilities' demand forecasts. However, where, as in the case at hand, growth rates are high or low relative to those of other recently approved demand forecasts, we look to factors which drive the demand forecast and may distinguish one utility from another. The Department notes that TMLP's models have been tested

using statistical techniques, and also using backcast tests. In each case, the models exhibited sound performance. As inputs to its models, TMLP has relied on timely and objective sources of data such as DRI. In arriving at our findings with respect to the reasonableness of forecasts for individual sectors, we look to factors potentially affecting growth such as proximity to transportation routes, population trends, residential and commercial development, historic growth rates and the past performance of the utility's models and any other factors that may be distinct to a particular service territory. Here, TMLP has presented sufficient evidence to support the individual sector growth rates and the overall growth rates for total energy requirements and peak load.

IV. DECISION

The Department hereby APPROVES the demand forecast and peak load forecast of Taunton Municipal Lighting Plant for the period 1993-2002.

By Order of the Department,

Kenneth Gordon, Chairman

Mary Clark Webster, Commissioner

Appeal as to matters of law from any final decision, order or ruling of the Commission may be taken to the Supreme Judicial Court by an aggrieved party in interest by the filing of a written petition praying that the Order of the Commission be modified or set aside in whole or in part.

Such petition for appeal shall be filed with the Secretary of the Commission within twenty days after the date of service of the decision, order or ruling of the Commission, or within such further time as the Commission may allow upon request filed prior to the expiration of twenty days after the date of service of said decision, order or ruling. Within ten days after such petition has been filed, the appealing party shall enter the appeal in the Supreme Judicial Court sitting in Suffolk County by filing a copy thereof with the Clerk of said Court. (Sec. 5, Chapter 25, G.L. Ter. Ed., as most recently amended by Chapter 485 of the Acts of 1971).